

PATENT

Attorney Docket No.: AMAT/8338/DSM/LOW K/JW

Express Mail No.:EV335470113US

What is claimed is:

1. A method of depositing an organosilicate layer on a substrate, comprising:  
reacting a gas mixture comprising an organosilicon compound in a processing chamber in the presence of RF power under conditions sufficient to deposit an organosilicate layer on a substrate disposed on a substrate support in the processing chamber, wherein the conditions comprise varying a distance between the substrate and a gas distribution manifold of the processing chamber.
2. The method of claim 1, wherein the conditions comprise initiating the RF power in the processing chamber while the substrate is at a first distance from the gas distribution manifold and depositing the organosilicate layer on the substrate while the substrate is at a second distance from the gas distribution manifold.
3. The method of claim 2, wherein the conditions further comprise terminating the RF power in the processing chamber while the substrate is at a third distance from the gas distribution manifold.
4. The method of claim 1, wherein the conditions comprising depositing the organosilicate layer on the substrate while the substrate is at a first distance from the gas distribution manifold and terminating the RF power in the processing chamber while the substrate is at a second distance from the gas distribution manifold.
5. The method of claim 1, wherein the gas mixture further comprises an oxidizing gas.
6. The method of claim 5, wherein the gas mixture further comprises a hydrocarbon.
7. The method of claim 5, wherein the gas mixture further comprises another organosilicon compound.

PATENT

Attorney Docket No.: AMAT/8338/DSM/LOW K/JW

Express Mail No.:EV335470113US

8. The method of claim 1, wherein the gas mixture comprises octamethylcyclotetrasiloxane, trimethylsilane, oxygen, and ethylene.
9. The method of claim 1, further comprising initiating the RF power in the processing chamber and introducing the organosilicon compound into the processing chamber, wherein the organosilicon compound is introduced into the processing chamber after the RF power is initiated.
10. The method of claim 1, further comprising terminating the RF power in the processing chamber, wherein a flow of the organosilicon compound into the processing chamber is terminated before the RF power is terminated.
11. The method of claim 1, further comprising terminating the RF power in the processing chamber, wherein a pressure of the chamber is maintained during termination of the RF power.
12. The method of claim 1, wherein the conditions further comprise initiating the RF power in the processing chamber by ramping up the RF power.
13. The method of claim 1, wherein the conditions further comprise terminating the RF power by ramping down the RF power after reacting the gas mixture.
14. A method of depositing an organosilicate layer on a substrate, comprising:
  - positioning a substrate on a substrate support in a processing chamber comprising a gas distribution manifold;
  - initiating RF power in the processing chamber;
  - reacting a gas mixture comprising an organosilicon compound in the processing chamber in the presence of RF power to deposit an organosilicate layer on the substrate; and then
  - terminating the RF power in the processing chamber, wherein the substrate is positioned further from the gas distribution manifold during the reacting a gas mixture

than during the initiating RF power, and the substrate is positioned closer to the gas distribution manifold during the terminating the RF power than during the reacting a gas mixture.

15. The method of claim 14, wherein the substrate is positioned further from the gas distribution manifold during the terminating the RF power than during the initiating the RF power.

16. The method of claim 14, wherein the organosilicon compound is a cyclic organosilicon compound, and the gas mixture further comprises one or more aliphatic compounds and one or more oxidizing gases.

17. A method of depositing an organosilicate layer on a substrate, comprising:  
reacting a gas mixture comprising an organosilicon compound in a processing chamber comprising a gas distribution manifold in the presence of RF power under conditions sufficient to deposit an organosilicate layer on a substrate disposed on a substrate support in the processing chamber such that a DC bias of the gas distribution manifold changes at a rate of less than about 50 V/sec.

18. The method of claim 17, wherein the conditions comprise varying a distance between the substrate and a gas distribution manifold of the processing chamber.

19. The method of claim 17, wherein the conditions comprising depositing the organosilicate layer on the substrate while the substrate is at a first distance from the gas distribution manifold and terminating the RF power in the processing chamber while the substrate is at a second distance from the gas distribution manifold.

20. The method of claim 17, wherein the one or more aliphatic compounds comprise an organosilicon compound, a hydrocarbon, or a mixture thereof.

21. A method of depositing an organosilicate layer on a substrate, comprising:

PATENT

Attorney Docket No.: AMAT/8338/DSM/LOW K/JW

Express Mail No.:EV335470113US

initiating RF power in a processing chamber comprising a gas distribution manifold; and

reacting a gas mixture comprising an organosilicon compound in the processing chamber in the presence of the RF power to deposit an organosilicate layer on a substrate disposed on a substrate support in the processing chamber, wherein the organosilicon compound is introduced into the processing chamber after the RF power is initiated.

22. The method of claim 21, wherein the gas mixture further comprises an oxidizing gas.

23. The method of claim 21, further comprising terminating the RF power in the processing chamber, wherein a pressure of the chamber is maintained during termination of the RF power.

24. The method of claim 21, further comprising terminating the flow of the organosilicon compound into the processing chamber and then terminating the RF power.

25. The method of claim 21, wherein the RF power is initiated by ramping up the RF power.

26. The method of claim 21, further comprising terminating the RF power by ramping down the RF power after reacting the gas mixture.

27. A method of depositing an organosilicate layer on a substrate, comprising:  
reacting a gas mixture comprising an organosilicon compound in a processing chamber comprising a gas distribution manifold in the presence of RF power to deposit an organosilicate layer on a substrate disposed on a substrate support in the processing chamber; and

PATENT

Attorney Docket No.: AMAT/8338/DSM/LOW K/JW

Express Mail No.:EV335470113US

terminating the RF power in the processing chamber, wherein a flow of the organosilicon compound into the processing chamber is terminated before the RF power is terminated.

28. The method of claim 27, wherein the gas mixture further comprises an oxidizing gas.

29. The method of claim 27, wherein a pressure of the chamber is maintained during termination of the RF power.

30. The method of claim 27, wherein the RF power is initiated by ramping up the RF power.

31. The method of claim 27, wherein the RF power is terminated by ramping down the RF power.